BY ORDER OF THE
SECRETARY OF THE AIR FORCE

AIR FORCE INSTRUCTION 32-1066
4 MAY 1994

Civil Engineering

PLUMBING SYSTEMS

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction implements AFPD 32-10, *Installations and Facilities*, by providing guidance for personnel maintaining and operating plumbing systems on Air Force installations. It adopts the *Uniform Plumbing Code* (*UPC*) and *Uniform Plumbing Code Illustrated Training Manual* for operations and maintenance purposes. Use of the name of any specific manufacturer, commercial product, commodity, or service in the UPC, the *UPC Illustrated Training Manual*, or this publication does not imply endorsement by the Air Force. Refer also to AFI 32-1067, *Water Systems* (formerly AFR 91-9 and AFR 91-10) and AFI 32-7041, *Water Quality Compliance* (formerly AFP 19-5). This instruction does not apply to the Air National Guard. Users should send comments and suggested improvements on AF Form 847, **Recommendation for Change of Publication**, through major commands (MAJCOM) and HQ AFCESA/ENM, 139 Barnes Dr, Tyndall AFB FL 32403-5319 to HQ USAF/CEO, 1260 Air Force Pentagon, Washington DC 20330-1260.

SUMMARY OF REVISIONS

This revision aligns the instruction with AFPD 32-10.

Supersedes: AFR 91-13, 15 November 1990.
OPR: HQ AFCESA/ENM (Mr Alvin Day)

Certified by: HQ AFCESA/CC (Col Donald Thomas, Sr.)
Pages: 5/Distribution: F

Section A—Uniform Plumbing Code Adoption

1. Objective. People working and living on our bases need safe and practical plumbing systems. The Base Civil Engineering team must have effective plumbing programs. This instruction, the UPC, and the *UPC Illustrated Training Manual* help achieve this objective.

2. How To Use This Instruction With the UPC and Training Manual. This instruction contains general plumbing information, backflow device inspection frequencies, unique maintenance tasks, and certification procedures. Consult the UPC and *Training Manual* to gain full planning and working knowledge of plumbing fixtures, devices, systems, and codes.

3. UPC Adoption Procedures:
3.1. UPC Adoption Date. The Air Force adopted the UPC (1988 edition) and *Illustrated Training Manual* in August 1988. UPC updates and republishes these publications every 3 years. The most current updated volumes are a part of this instruction.
3.2. UPC Compliance Guidelines:
3.2.1. Bases under US jurisdiction must use the UPC and the *Illustrated Training Manual* to inspect, test, repair, and replace plumbing systems. Federal, state, and local regulations pertaining to safe drinking water laws also apply where they are more stringent.
3.2.2. At bases overseas, paragraph 3.2.1 applies, except when in conflict with a host country prefers the UPC, request guidance from the MAJCOM civil engineer.
3.3. UPC Administrative Authority. Part I of the UPC does not apply to Air Force personnel. Beginning with chapter 1, Base Civil Engineering is the administrative authority for the operation, maintenance and replacement of existing plumbing.
3.4. Purchasing the UPC and Training Manual. The International Association of Plumbing and Mechanical Officials (IAPMO), 20001 South Walnut Drive, Walnut CA 91789 ([714]595-8449), publishes the UPC and *Illustrated Training Manual*. Organizations needing these publications must pay for them. AFCESA/ENM is a Class A member of the thus Air Force organizations and members can buy IAPMO publications at membership prices. Order copies for official use from the publisher through the base library or contracting office. To receive Air Force membership prices, mark the order “For Use by US Air Force.”
3.4.1. Air Force personnel can purchase personal copies of these publications directly from the publisher. To receive Air Force membership prices, mark the order according to paragraph 3.4. The publisher also has publications pertaining to other civil engineering career fields. The UPC contains a list of these publications.
3.4.2. Each MAJCOM, Base Civil Engineering organization, and education or training school should order a copy of the IAPMO Directory of Research Recommendations. The directory is a list of plumbing products, by manufacturer, that passed the IAPMO laboratory test for their intended purpose. The list contains many manufacturers offering a wide variety of plumbing products. It will help in locating acceptable plumbing material, fixtures, and backflow devices. Contact the publisher (paragraph 3.4) for ordering instructions.
3.5. Publication Conflicts. If a conflict exists between the UPC and Air Force publications, comply with the Air Force publication and notify the MAJCOM and HQ AFCESA/ENM.

Section B—Responsibilities

4. HQ AFCESA/ENM:
- Formulates Air Force policy and instructions for maintaining plumbing systems.
- Provides plumbing consultant services.

5. MAJCOM:
- Gives management and technical assistance to all bases.
- Establishes a cross-connection control program according to this instruction.

6. Base Civil Engineering:
- Appoints an engineer or appropriate supervisor as the Backflow Program Manager. The appointee must have a copy of the UPC and *Training Manual*and be familiar with their contents.
- Notifies the MAJCOM/CE when the potable water supply becomes contaminated.

7. Base Civil Engineering Chief of Operations:
- Makes sure personnel follow this instruction, the UPC, and the *Illustrated Training Manual* when they inspect, test, repair, or replace plumbing systems and fixtures.

8. Backflow Program Manager:

- Maintains an aggressive program to identify, isolate, record, and correct cross-connections and other potential sources of distribution system contamination.
- Makes sure plumbing personnel can properly test, install, maintain, and repair backflow prevention devices.
- Conducts a facility survey of plumbing devices and systems (excluding military family housing unless underground sprinkler systems are installed) every 5 years and updates records (see paragraph 12.1).

NOTE: Coordinate surveys with the base Bioenvironmental Engineering Service (BES).

- Identifies and forecasts training requirements for Base Civil Engineering personnel.
- Reviews all plans and drawings of new or modified water systems to identify potential cross-connections and verifies control devices are specified.

9. Base BES:

- Using the UPC, assigns a degree of hazard to each cross-connection.
- Reviews plans for water system modification to prevent cross-connection and to identify existing cross-connections or other potential sources of contamination or pollution (AFI 48-101, *The Aerospace Medical Program* [formerly AFR 161-33]) and recommends corrective action.

Section C—Backflow Prevention

10. Cross-Connection Control Terms. The *UPC Illustrated Training Manual, chapter 1,* defines cross-connection and backflow terms.

11. Use of Backflow Prevention Equipment. Base Civil Engineering personnel must eliminate the potential for a cross-connection. If not feasible, install an approved prevention device. It must prevent contamination of potable water supplies susceptible to backpressure or back-siphonage from fixtures, equipment, appliances, or buildings. If the potable water supply is critical, install approved backflow preventers in parallel to allow maintenance or repair without system shutdown.

12. Surveying the Facilities and Systems:

12.1. Conducting the Survey. Every 5 years, Base Civil Engineering plumbers (utility personnel) and the base environmental engineer must survey all facilities and water-using equipment and systems. Survey military family housing only if underground lawn sprinkler systems are installed. Survey personnel locate backflow prevention devices, assess their adequacy, and determine the need for more devices. From this, they determine potential or existing cross-connections and the degree of hazard.

12.2. Recording Surveys. The team records survey results on AF Form 848, **Inventory of Cross-Connection Control and Backflow Prevention Devices.** The Backflow Program Manager uses this information to maintain other records for installed devices and to set testing schedules. The zone supervisor documents requirements for new or additional backflow prevention devices and places them in a suitable program. The Backflow Program Manager centrally maintains inspection records and the status of installation and upgrade actions.

NOTE: Eliminate any severe cross-connections immediately. The *UPC Illustrated Training Manual,* chapter 10, defines cross-connections, degrees of hazard, and recommended types of backflow prevention devices.

12.3. Equipment Excluded From Backflow Prevention. Except for laboratory sinks and sinks with hose threaded faucets, backflow preventers integral to a standard plumbing fixture do not come under this program.

12.4. Definition of “Approved.” The term “approved” means the IAPMO laboratory tested the product and it meets their standards. IAPMO-approved products carry an attached or imprinted IAPMO seal of approval. Base Civil Engineering can, with MAJCOM coordination, approve the installation of a new product or device not yet approved by IAPMO. Base Civil Engineering must ensure it will safely satisfy the intended purpose.

12.5. Existing Devices. During the survey of base cross-connections, identify all existing backflow protective devices by a control number. Replace unapproved devices in priority depending on the degree of hazard. Do not wait until the device fails. Contact the MAJCOM civil engineer for help when uncertain about the device’s category or level of protection.

12.6. Fire Suppression Systems. Install a double check valve backflow preventer on new dry/wet fire suppression systems using water only as a fire suppressant. Use a reduced pressure type backflow device where antifreeze or other hazardous chemicals are added. NFPA 13 requires backflow preventers are approved and listed for fire protection use by acceptable testing agencies such as Underwriters Laboratories or Factory Mutual. Because pressure loss through a valve can degrade the effectiveness of a fire suppression system, design and submittal acceptance must ensure the rated working flow rate of the

valve selected or installed meets the flow requirements of the system. Perform backflow prevention retrofit work when systems are down for major renovation unless the threat dictates otherwise.

13. Test and Inspection Schedule. The Backflow Prevention Manager establishes a schedule for testing and inspecting all backflow protection devices, including air gaps. Certified technicians must perform the tests and inspections. Set up the frequency for testing, inspection, and overhaul of each device according to age, condition, and degree of hazard. Perform overhauls according to manufacturer recommendations. The inspecting and testing schedule should be a part of the recurring work program. Table 1 contains recommended time intervals for backflow protection devices. See the *UPC Illustrated Training Manual*, chapter 10, for degree of hazard definitions.

Table 1. Recommended Time Intervals for Inspection.

Degree of Hazard	Inspection Interval
Minor	24 months
Moderate	24 months
Severe	6 months
(Air Gap)	12 months

13.1. Inspection Tasks. A certified backflow inspector must inspect all cross-connections to make sure:

- There is an approved air gap.
- The backflow prevention devices are in good condition.
- Newly installed devices were correctly installed and free of debris that could interfere with the functioning of devices. Accomplish this inspection within 1 week after installation; perform a followup inspection 3 months later.

13.2. Testing Devices. Test all devices according to the UPC, the *UPC Illustrated Training Manual*, or the manufacturer's instructions. Repair and retest, or replace defective devices.

13.3. Records of Inspections:

13.3.1. The inspector records data on all cross-connections on AF Form 845, **Cross-Connection Information,** or an approved computerized version.

13.3.2. The inspector then fills out the form appropriate for the type of device: AF Form 843, **Backflow Prevention Inspection Data;** or 844, **Backflow Prevention (Vacuum Breakers) Inspection Data.** Fill in the blank columns according to headings. For an air gap, the test consists of a visual inspection and an "OK" recorded (if satisfactory).

For other backflow devices, the testing is more involved.

13.4. Recordkeeping. Maintain cross-connection control and backflow prevention device records at a central location. Maintain an inventory of all device locations and an individual record (AF Form 845) for each. The Backflow Program Manager must keep the records current and complete.

Section D—Backflow Certification Program

14. General Information. To protect potable water, certification is necessary to ensure qualified personnel properly test and maintain backflow prevention devices. Certification is essential in meeting the standards of Public Law 93-523, *The Safe Drinking Water Act.* The Air Force program mirrors State programs and allows the flexibility of moving Air Force technicians from state to state without having to retrain and recertify them. Certify both military and civilian plumbers.

15. Certification Procedures. MAJCOMs certify and recertify backflow prevention technicians assigned to their command using AF Form 483, **Certificate of Competency.**

NOTE: Current certificates issued using other forms are valid until they expire. Make all certifications valid for 3 years. Transfer of personnel between MAJCOMs does not require recertification until the certificate expires.

16. Certification Requirements:

16.1. Initial Certification. MAJCOMs issue the certification based on the recommendation of Base Civil Engineering and a common sense evaluation of circumstances (for example, at a remote site without 7-level plumbers, certify a 5-level). Individuals recommended by Base Civil Engineering for certification should have the qualifications listed below:

- Be a senior plumber, preferably a 7-level or equivalent.
- Have previously participated in inspecting and testing backflow devices.
- Have satisfactorily completed an approved training program such as:
- Sheppard Technical Training Center's "Backflow Prevention Devices" course.

- A backflow prevention course approved by the host state.
- A backflow prevention course sponsored by a nationally or internationally recognized professional organization.

NOTE: Do not use the third option if it conflicts with the host state or country requirements.

16.2. Recertification. The MAJCOM recertifies technicians using data furnished by Base Civil Engineering. Base Civil Engineering requests recertification and provides the following information at least 60 days before the expiration date on the AF Form 483:

- Date the technician completed the approved training course.
- Date and description of any supplemental backflow prevention course taken.
- The type devices inspected and the frequency the technician tests, inspects, and maintains them.
- A statement certifying the technician's proficiency maintaining the devices.

NOTE: If the technician has inspected and tested a representative number (normally 50) of doublecheck and/or reduced pressure type backflow devices since last certified, a retraining course is unnecessary.

16.3. Personnel Gains and Losses. The Chief of Operations must give the MAJCOM a list of currently assigned certified technicians, and update it as changes occur. The MAJCOMs maintain a current list of certified technicians for each of their bases.

16.4 Forms Prescribed:

- AF Form 843, **Backflow Prevention Inspection Data.**
- AF Form 844, **Backflow Prevention (Vacuum Breakers) Inspection Data.**
- AF Form 845, **Cross-Connection Information.**
- AF Form 848, **Inventory of Cross-Connection Control and Backflow Prevention Devices.**

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